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Filing Date:	November 28, 2001	:	Examiner:	
For:	**Device for Use in Eye Surgery**			

TRANSMITTAL OF CERTIFIED PRIORITY DOCUMENT

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Dear Sir:

Submitted herewith is a certified copy of Swedish priority application No. 0004393-5 filed November 29, 2000. The priority document is in the English language. It is believed that this satisfies the requirements of 35 U.S.C. §119.

Respectfully submitted,

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This is to certify that the annexed is a true copy of the documents as originally filed with the Patent- and Registration Office in connection with the following patent application.

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A device for use in eye surgery

Field of invention

The present invention relates to a sealing device comprising a plug part adapted to seal a rhexis in a capsular bag and thus preventing displacement through the rhexis of a lens-forming liquid material injected through the rhexis and adapted to replace the natural lens and form an intraocular lens implant.

It also relates to a method of manufacturing an intraocular lens inside a capsular bag after that the natural lens has been removed

Background of the invention

A technique for removing the natural lens and replacing it by a lens-forming liquid material injected directly into the capsular bag is under development. This is described in for example the patent application with application number SE 0001934-9. The liquid material is a partially polymerized material, which can undergo a curing process in the eye and thereby form a solid lens implant. This lens implant acts as a substitute for the natural lens. Materials and methods suitable for injection and subsequent formation of an IOL (Intra Ocular Lens) are disclosed in the patent applications with numbers PCT/EP99/07781, PCT/EP99/07780, PCT/EP99/01766 and SE 0001934-9. To insert the liquid material and also for removing the natural lens a capsulorhexis has to be provided to the capsular bag. The cataracteous natural lens can be removed by a conventional phacoemulsification method. An injection syringe needle is inserted through an incision in the eye and through the capsulorhexis into the capsular bag and the lens-forming liquid material can be injected into the capsular bag.

A problem is that during the injection and before the final lens is formed when the injection syringe needle has been removed the injected lens material can leak out from the capsular bag through the capsulorhexis. A plug for preventing leakage from the capsular bag has been proposed in the patent with number JP97-308946. This plug is adapted to be attached to the injection syringe needle and inserted to the eye and positioned in the right position in the rhexis when the syringe needle is inserted. A

problem with this plug is that it is clamped and/or glued in the rhexis. Since the plug is relatively big and adapted to stay in the rhexis permanently optical problems could arise. Furthermore it needs a relatively large opening in the eye to be implanted. The plug comprises also a filling tube, which has to be cut off after filling. The tube could cause a leak. The size of the plug may also influence the free movement of the capsule that is needed for an even deformation of the capsule during accommodation.

Summary of the invention

It is an object of the invention to provide a capsulorhexis plug that effectively prevents a liquid inserted into the capsular bag to leak out through the rhexis.

Another object is to provide a sealing device having means by which its location can be controlled after its insertion throughout the capsule filling process.

A further object of the invention is to overcome the above stated problems present in the existing capsulorhexis plug.

Still a further object of the invention is to provide a capsulorhexis plug that compensates for refractive errors and/or wavefront aberrations of the optical parts of the eye.

These objects are achieved in a sealing device of the initially defined kind, wherein said plug part has a slightly larger area than the capsulorhexis and is made of a deformable polymer and wherein the sealing device comprises an adjusting means, connected to the plug part, said adjusting means having the function of positioning said plug part to a desired location.

Preferably said plug part is essentially disc-shaped and suitably said plug part is adapted to be placed at the inside of the capsular bag, covering the whole capsularhexis.

Suitably said plug part is made of a suitable soft material and it should be thin enough for following the accommodation movements of the capsular bag. Preferably the plug part is made from a silicon material. Also preferably said plug part is made of a material having essentially the same refractive index as the material inserted in the capsular bag. This is important especially if the plug part is left in the capsular bag after that the lens-forming process is completed. Hereby the sealing device does not affect the visual quality.

Preferably the sealing device has a roughened surface on at least the surface contacting the inner wall of the capsular bag. Hereby the contact between the sealing device and the inner wall of the capsular bag is improved.

Suitably the sealing device has an anteriorly extending ring in the middle with a diameter fitting into the rhexis from below. The ring is adapted to stabilize the position of the sealing device in the rhexis.

The adjusting means can be at least one thread attached to the plug part. This at least one thread protrudes suitably in an anterior direction from the plug part. Said at least one thread is also preferably of such a length that it protrudes to outside the eye and can be manipulated from outside the eye.

The plug part can be provided with an elevation in the center extending anteriorly when the plug part is positioned in the capsular bag.

The adjusting means can alternatively be a wire, which extends outside the capsular bag essentially co-planar to the plug part and said wire is attached to the elevation, where the elevation essentially protrudes through the rhexis when the plug part is positioned in the capsular bag so that the wire is admitted to stabilize the plug part from the outside of the capsular bag. Suitably the distance between the wire and the plug part is essentially greater than the capsular wall thickness. Hereby the plug part can be located inside the capsular bag while the wire is located outside the capsular bag. The wire is preferably less flexible than the material of the plug part and the capsular bag.

In one embodiment the plug part has a cut admitting passage of the lens-forming material. Hereby the sealing device can be kept in position during the injection. Suitably the cut is provided with an overlapping part adapted to seal the cut when the injection is completed. Otherwise the injected lens-forming material may leak out through the cut.

Either the sealing device is adapted to be positioned in a rhexis of about 1 mm in diameter positioned off the optical axis of the eye or it is adapted to be positioned in a rhexis of more than 1 mm in diameter positioned so to include the optical axis of thc eye.

If the rhexis is positioned so to include the optical axis it could preferably be of such a size that it covers the whole path of light that is admitted by the pupil. Then it should also preferably be left in the capsular bag. Suitably the plug part then is

optically clear and it could be designed to compensate for aberration and to correct for error of refraction in the eye.

If the rhexis is positioned off the optical axis the sealing device could be left in the capsular bag without disturbing the vision. It could also be removed after that the intraocular lens-forming process is completed

The mentioned objects are also achieved by a method of the initially defined kind, comprising the steps of:

- inserting a plug part of a sealing device through a capsulorhexis, said plug part being adapted to cover the capsulorhexis from the inside of the capsular bag;
- adjusting said plug part by means of an adjusting means operable from the outside of the capsular bag;
- delivering a lens-forming mterial through the rhexis into the capsular bag by using a delivering means and by displacing and/or deforming the plug part to admit passage for the material;
- removing the delivering means out from the eye, whereby the plug part regains it's original position in front of the rhexis, thereby preventing displacement of the lens-forming liquid material out from the capsular bag .

In one embodiment the method comprises removing the sealing device through the capsulorhexis when the lens-forming process is completed. Otherwise only the adjusting means could be removed when the plug part has been positioned over the capsulorhexis by the inserted lens-forming material in the capsular bag.

Suitably the method comprises deforming the plug part so as to obtain a shape insertable through the capsulorhexis.

Preferably the method comprises controlling the position of said plug part by means of the adjusting means.

In one embodiment the method comprises inserting the lens-forming material to the capsular bag through a cut in the plug part and through the capsulorhexis.

Suitably the method further comprises measuring the error of refraction of the eye and designing the plug to further compensate for error of refraction. Preferably the method also comprises measuring the aberration of the cornea and/or estimating the aberration of the lens to be formed in the capsular bag and designing the surface of the plug to compensate for the aberration of the eye.

Brief descripti n of the drawings

Fig. 1a is a schematic view from above of a sealing device according to a first embodiment of the invention.

Fig. 1b is a side view of the sealing device in Fig. 1a inserted into a capsular bag.

Fig. 2a is a schematic view from above of a sealing device according to a second embodiment of the invention.

Fig. 2b is a side view of the sealing device in Fig. 2a inserted into a capsular bag.

Fig. 3 is a view from above of a third embodiment of the sealing device according to the invention.

Fig. 4 is a view from above of a forth embodiment of the sealing device according to the invention.

Fig. 5 is a side view of a sealing device according to the invention inserted into a capsular bag.

Detailed description of the embodiments

Fig. 1a is a schematic view from above of a sealing device 1 according to a first embodiment of the invention. The sealing device 1 comprises a plug part 2. This part is in this embodiment essentially disc-shaped but other shapes are possible. The plug part 2 is adapted to be placed over a capsulorhexis from the inside of a capsular bag. The important thing with the form of the plug part 2 is that it covers the whole capsulorhexis. The plug part 2 is made of a deformable polymer such as a silicon material and it is provided with an elevation 3 in the center. The elevation 3 is in this embodiment made of the same material as the plug part 2 but it could be made of another material as well. The elevation 3 protrudes through the rhexis when the sealing device is located in the desired location in the capsulorhexis. Thus the elevation 3 extends anteriorly in the eye. In this embodiment an adjusting means 5 is

attached to the elevation 3 through a through hole in the elevation 3. The adjusting means 5 can in another embodiment be attached to the elevation 3 in another way, by means of for example glue. The adjusting means 5 is a wire and it extends above and co-planar to the plug part 2 of the sealing device 1. It is thus adapted to be located outside the capsular bag while the plug part is located inside the bag. The adjusting means 5 is in this embodiment about three mm and the plug part 2 of the sealing device 1 has a diameter of about 2,5 mm. By means of the adjusting means 5 the sealing device 1 is hold in a desired location in the rhexis. The adjusting means 5 is in this embodiment less flexible than both the plug part 2 of the sealing device and the capsular bag.

Fig. 1b is a side view of the sealing device 1 shown in Fig. 1a inserted into a capsular bag 7. The plug part 2 of the sealing device 1 was deformed during the insertion to let the plug part 2 inside the capsular bag 7 through a capsulorhexis 9 in the capsular bag 7. Thus it is important that the material of the plug is soft and foldable. The rhexis 9 is located outside the optical axis of the eye and it is about one mm in diameter. The plug part 2 of the sealing device 1 has a larger diameter and covers the rhexis 9 completely. The dimensions of the rhexis 9, the plug part 2 and the adjusting means 5 can vary. However, the diameter of the rhexis 9 and thus the diameter of the plug part should be rather small such that the vision quality not is affected if the plug part is left in the eye. When the sealing device 1 is left in the rhexis 9 the plug part 2 preferably is made of such a material and has such dimensions that it follows the deformation of the capsular bag. Thus the material has to be soft enough and thin enough in relation to the capsular bag material. Preferably the material is softer than the material of the capsular bag and thicker than the capsular bag wall. The plug can be made of a high refractive silicon material such as described in US 5,444,106. The refractive index of the material in the plug part 2 is not that critical since the plug part is positioned outside the optical axis of the eye. However, the plug part 2 could be made of an optical clear material having a suitable refractive index corresponding to the refractive index of the injected lens material in order to make as little disturbance as possible to the vision. The sealing device 1 could also be deformed and removed out from the capsular bag and the eye when the lens implant has been formed.

The adjusting means 5 keeps the sealing device 1 in a desired location by stabilizing the sealing device 1 from the outside of the capsular bag. In one embodiment, the wire 5 leans on the outer wall of the capsular bag 7 around the rhexis

9. The anterior extension of the elevation and thus the distance between the adjusting means 5 and the plug part 2 should be essentially larger than or essentially the same as the thickness of the capsular wall. The sealing device 1 is inserted into the eye to cover the rhexis before the lens-forming liquid material is inserted, but after the natural lens has been removed.

When the lens-forming material is injected a delivering means, here an injection syringe is used. The injection syringe needle is inserted through the eye and through the capsulorhexis by sufficiently displacing and/or deforming the sealing device so the needle is admitted into the capsular bag. After the injection the syringe needle is removed out from the capsular bag and the eye and the pressure exerted by the fluid lens-forming material provides the sealing device to regain it's original position and shape in front of the rhexis thus preventing the lens-forming material to leak out. The lens-forming material can now be cured into the final lens implant and the wire can be removed from the eye with for example a forceps. To be noted is that the injection syringe not actually needs to be inserted all the way into the capsular bag. It is enough to inject the lens-forming material outside the rhexis in a direction towards the rhexis. Then the material will force itself through the sealing device and into the capsular bag. If a small amount of the material would be left in the anterior chamber of the eye it will easily be flushed out by the rinsing liquid as used during the surgical procedure.

Fig. 2a is a schematic view from above of a sealing device 21 according to a second embodiment of the invention. Also this sealing device 21 comprises an essentially disc-shaped plug part 23 and an adjusting means 25. The plug part 23 is made of a deformable polymer such as a silicon material. In this embodiment the adjusting means 25 is a nylon thread attached at its middle to the center of the plug part 23. For example, the thread can pass through two holes in the plug part 23 leaving the adjusting means 25 with two thread ends 26a and 26b pointing out from the plug part 23 on the same side. This thread 25 could of course be attached to the plug part 23 in some other way and it can be made from another material than nylon. It is also possible to only attach one end of the thread to the plug part 23 leaving only one end pointing out from the plug part 23. The nylon thread used in this embodiment is not stiff as the wire in the first embodiment. The material of the plug part 23 is preferably of the same kind as described for the first embodiment. It could have a

refractive index compatible with the lens material and it should follow the deformation of the capsular bag if the sealing means is adapted to be left in the rhexis.

Fig. 2b is a side view of the sealing device 21 shown in Fig. 2a inserted into a capsular bag 28. Also in this embodiment the plug part 23 of the sealing device 21 is inserted inside the capsular bag and it is adapted to cover a rhexis 30 in the capsular bag from below. The nylon threads 26a, 26b are extending anteriorly from the sealing device 21 and preferably they are long enough to protrude out of the eye. Thus, the sealing device 21 can be controlled and kept in the desired location from outside the eye. The sealing device 21 is adapted to be inserted into the eye before the lens-forming liquid material is injected and after that the natural lens has been removed.

An injection syringe needle is as in the first embodiment inserted through the eye and the rhexis to inject a lens-forming liquid material into the capsular bag. The liquid material can be a silicon material that will cure in ambient body temperature or that will cure through another curing mechanism by means of photosensitizers activated by light of a selected wavelength as further described in PCT/EP99/07781. When the lens-forming fluid has filled the capsular bag the sealing device 21 is pressed against the inner wall around the rhexis of the capsular bag by the lens implant. If the sealing device 21 is adapted to be left in the capsular bag only the adjusting means 25 is removed. Otherwise, the whole sealing means 21 is removed. The plug part 23 could be deformed by an instrument operated from outside the eye such that it can be removed through the rhexis. The position and the size of the rhexis could be the same as described for the first embodiment but if the plug part is adapted to be left in the rhexis the rhexis preferably is positioned so as to include the optical axis. The rhexis is also preferably larger than one mm in diameter and thus the plug part also has to be larger than in the first embodiment to cover the whole rhexis. In fact the plug part preferably covers the whole path of light that is admitted by the pupil. In the case where the plug part 23 is left in the eye the plug part 23 material should also have essentially the same refractive index as the lens-forming material. When the sealing device 1 is left in the rhexis 9 the plug part 2 preferably is made of such a material and has such dimensions that it follows the deformation of the capsular bag as described above.

The plug part 23 can in this embodiment preferably be designed to further correct for refractive error in the eye. It can also be designed to correct for aberration defects of the optical surfaces of the eye, such as spherical aberration. The necessary

measurements of the aberrations of the eye and the designing of a surface needed to be provided to the plug part 23 to compensate for the aberration are disclosed in detail in the patent application SE 0001925-7 which is incorporated in this application by reference.

Fig. 3 is a view from above of a sealing device 41 according to a third embodiment of the invention. This third embodiment of the sealing device 41 principally follows the second embodiment of the sealing device. It comprises a plug part 43 and an adjusting means 45. The materials and the dimensions are the same and the use of the sealing device is also the same. The difference is that the plug part 43 is provided with a roughened surface 47 on the part of the surface contacting the inner wall of the capsular bag. The purpose of this roughened surface 47 is to keep the sealing device 41 in the desired location covering the rhexis. The plug part 43 comprises also a cut 49 along a radius of the disc-shaped plug part 43. The purpose of the cut 49 is to make it easier for the injection syringe needle to come through the rhexis during the injection and to minimize the leakage of the injected material through the rhexis during the injection. Preferably the plug part 43 also is provided with an overlapping part 51 under the cut 49. The purpose of the overlapping part 51 is to prevent the material from leaking out through the cut 49 after the needle has been removed. As explained above it is not necessary to insert the injection syringe needle all the way through the rhexis to insert the lens-forming material. However, the cut 49 also in this case simplifies the injection.

Fig. 4 is a view from above of a sealing device 61 according to a forth embodiment of the invention. Also this forth embodiment of the sealing device 61 principally follows the second embodiment of the sealing device. It comprises a plug part 63 and an adjusting means 65. The materials and the dimensions are the same and the use of the sealing device is also the same. The difference is that the plug part 63 comprises on the surface from which the adjusting means 65 protrudes an anteriorly protruding ring 67 with a slightly smaller diameter than the diameter of the rhexis. This ring 67 is adapted to fit into the rhexis when the plug part 63 has been located in the capsular bag so as to keep the sealing device 61 in the correct position sealing the rhexis from the inside of the capsular bag.

Fig. 5 is a side view of a sealing device 71 of any of the above mentioned kind inserted into a capsular bag 73 through a rhexis 75. The rhexis 75 is in this case located off the optical axis A of the eye. The rhexis 75 has here a diameter of only

about 1 mm and a plug part 77 of the sealing device 71 has thus a slightly larger diameter. The sealing device 71 could in this case either be left in the capsular bag 73 since it is located off the optical axis and not will disturb the vision or be removed from the eye. The removing of the sealing device 71 is easier in this case when the sealing device is smaller.

Of course the different described features in all these embodiments can be combined in all possible ways.

Claims

1. A sealing device (1;21;41;61;71) comprising a plug part (2;23;43;63;77) adapted to seal a rhexis (9;30;75) in a capsular bag (7;28;73) and thus preventing displacement through the rhexis (9;30;75) of a lens-forming liquid material injected through the rhexis (9;30;75) and adapted to replace the natural lens and form an intraocular lens implant, **characterized in that** said plug part (2;23;43;63;77) has a slightly larger area than the capsulorhexis (9;30;75) and is made of a deformable polymer and in that the sealing device (1;21;41;61;71) comprises an adjusting means (5;25;45;65), connected to the plug part (2;23;43;63;77), said adjusting means (5;25;45;65) having the function of positioning said plug part (2;23;43;63;77) to a desired location.

2. A sealing device according to claim 1, wherein said plug part (2;23;43;63;77) is essentially disc-shaped.

3. A sealing device according to any one of the preceding claims, wherein said plug part (2;23;43;63;77) is adapted to be placed at the inside of the capsular bag (7;28;73), covering the whole capsularhexis (9;30;75).

4. A sealing device according to any one of the preceding claims, wherein said plug part (2;32;43;63;77) being made of a suitable soft material and being enough thin for following the accommodation movements of the capsular bag.

5. A sealing device according to any one of the preceding claims, wherein said plug part (2;23;43;63;77) is made of a silicon material.

6. A sealing device according to any one of the preceding claims, wherein said plug part (2;23;43;63) is made of a material having essentially the same refractive index as the material inserted in the capsular bag (7;28).

7. A sealing device according to any one of the preceding claims, having a roughened surface (47) on at least the surface contacting the inner wall of the capsular bag (7;28).

8. A sealing device according to any one of the preceding claims, having an anteriorly extending ring (67) in the middle with a diameter fitting into the rhexis from below, the ring (67) being adapted to stabilize the position of the sealing device (61) in the rhexis.

9. A sealing device according to any one of the preceding claims, wherein the adjusting means (5;25;45;65) is at least one thread (25;45) attached to the plug part (23;43;63).

10. A sealing device according to claim 9, wherein the at least one thread (25;45;65) protrudes in an anterior direction from the plug part (23;43;63).

11. A sealing device according to claim 10, wherein said at least one thread (25;45;65) is of such a length that it protrudes to outside the eye and can be manipulated from outside the eye.

12. A sealing device according to any one of the preceding claims, wherein the plug part (2) is provided with an elevation (3) in the center extending anteriorly when the plug part (2) is positioned in the capsular bag (7).

13. A sealing device according to claim 12, wherein the adjusting means (5) is a wire, which extends outside the capsular bag (7) essentially co-planar to the plug part (2) and said wire (5) is attached to the elevation (3), where the elevation (3) essentially protrudes through the rhexis (9) when the plug part (2) is positioned in the capsular bag (7) so that the wire (5) is admitted to stabilize the plug part (2) from the outside of the capsular bag (7).

14. A sealing device according to claim 13, wherein the distance between the wire (5) and the plug part (2) is essentially greater than the capsular wall thickness.

15. A sealing device according to claim 13 or 14, wherein the wire (5) is less flexible than the material of the plug part (2) and the capsular bag (7).

16. A sealing device according to any one of the preceding claims, wherein the plug part (43) has a cut (49) admitting passage of the lens-forming material.

17. A sealing device according to claim 16, wherein the cut (49) is provided with an overlapping part (51) adapted to seal the cut (49) when the injection is completed.

18. A sealing device according to any one of the preceding claims, being adapted to be positioned in a rhexis (9;75) of about 1 mm in diameter positioned off the optical axis of the eye.

19. A sealing device according to any one of the claims 1-17, being adapted to be positioned in a rhexis (30) of more than 1 mm in diameter positioned to include the optical axis of the eye.

20. A sealing device according to any one of the preceding claims, being adapted to remain in the capsular bag (7;28;75) after the intraocular lens-forming process is completed.

21. A sealing device according to claim 19 and 20, wherein said plug part (2;32;43) being optically clear.

22. A sealing device according to claim 21, wherein said plug part (2;32;43) covers the whole path of light that is admitted by the pupil.

23. A sealing device according to claim 21 or 22, being designed to compensate for aberration.

24. A sealing device according to any one of the claims 21-23, being designed to correct for error of refraction in the eye.

25. A sealing device according to any one of the claims 1-19, being adapted to be removed after the intraocular lens-forming process is completed.

26. A method of manufacturing an intraocular lens inside a capsular bag (7;28;73) after that the natural lens has been removed, **characterized in that** it comprises the steps of:

- inserting a plug part (2;23;43;63;77) of a sealing device (1;21;41;61;71) through a capsulorhexis (9;30;75), said plug part (2;23;43;63;77) being adapted to cover the capsulorhexis (9;30;75) from the inside of the capsular bag (7;28;73);
- adjusting said plug part (2;23;43;63;77) by means of an adjusting means (5;25;45;65) operable from the outside of the capsular bag (7;28;73);
- delivering a lens-forming material through the rhexis (9;30;75) into the capsular bag (7;28;73) by using a delivering means and by displacing and/or deforming the plug part (2;23;43;63;77) to admit passage for the material;
- removing the delivering means out from the eye, whereby the plug part (2;23;43;63;77) regains it's original position in front of the rhexis (9;30;75), thereby preventing displacement of the lens-forming liquid material out from the capsular bag (7;28;73).

27. A method according to claim 26 further comprising the step of removing the sealing device (1;21;41;61;71) through the capsulorhexis (9;30;75) when the lens-forming process is completed.

28. A method according to claim 26, comprising the step of removing the adjusting means (5;25;45;65) when the plug part (2;23;43;63;77) has been positioned over the capsulorhexis (9;30;75) by the inserted lens-forming material in the capsular bag (7;28;73).

29. A method according to any one of the claims 26-28, further comprising the step of deforming the plug part (2;23;43;63;77) so as to obtain a shape insertable through the capsulorhexis (9;30;75).

30. A method according to any one of the claims 26-29, further comprising the step of controlling the position of said plug part (2;23;43;63;77) by means of the adjusting means (5;25;45;65).

31. A method according to any one of the claims 26-30, further comprising the step of inserting the lens-forming material to the capsular bag (7;28) through a cut (49) in the plug part (43) and through the capsulorhexis (9;30).

32. A method according to any one of the claims 26-31, further comprising measuring the error of refraction of the eye and designing the plug to further compensate for error of refraction.

33. A method according to any one of the claims 26-32, further comprising measuring the aberration of the cornea and/or estimating the aberration of the lens to be formed in the capsular bag and designing the surface of the plug to compensate for the aberration of the eye.

Abstract

The present invention relates to a method of manufacturing an intraocular lens inside a capsular bag (7;28;73) after that the natural lens has been removed and to a sealing device (1;21;41;61;71) comprising a plug part (2;23;43;63;77) adapted to seal a rhexis (9;30;75) in a capsular bag (7;28;73) and thus preventing displacement through the rhexis (9;30;75) of a lens-forming liquid material injected through the rhexis (9;30;75) and adapted to replace the natural lens and form an intraocular lens implant.

According to the invention said plug part (2;23;43;63;77) has a slightly larger area than the capsulorhexis (9;30;75) and is made of a deformable polymer. Also according to the invention the sealing device (1;21;41;61;71) comprises an adjusting means (5;25;45;65), connected to the plug part (2;23;43;63;77), said adjusting means (5;25;45;65) having the function of positioning said plug part (2;23;43;63;77) to a desired location.

Fig. 2b

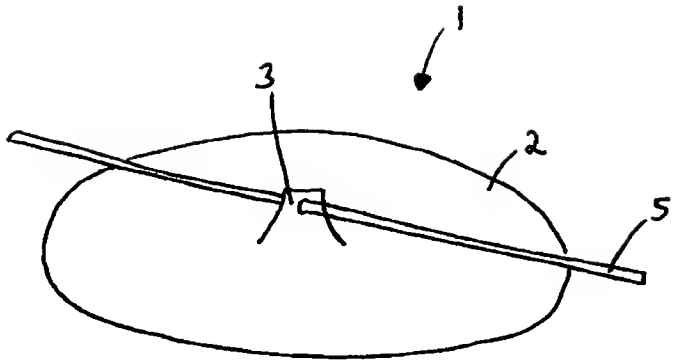

Fig. 1a

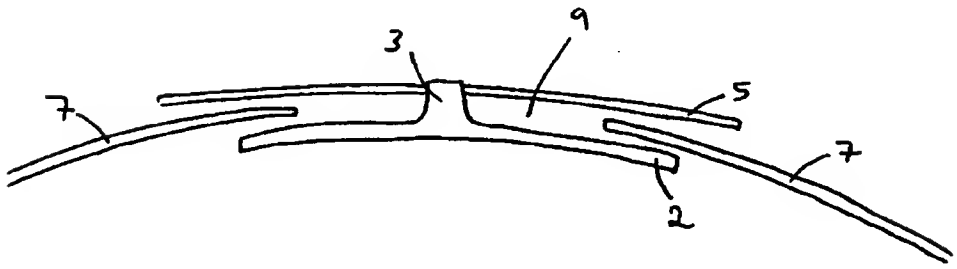

Fig. 1b

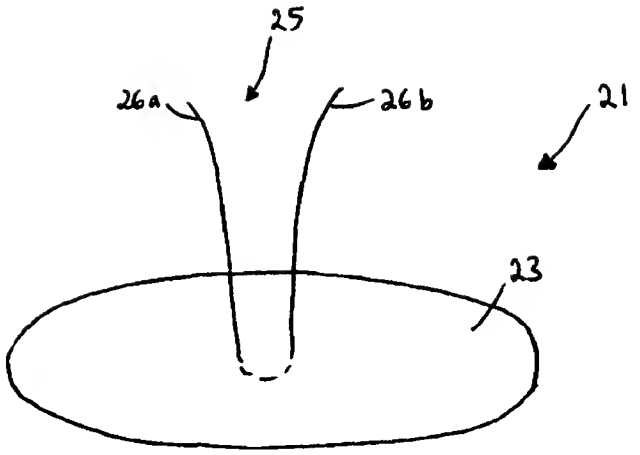

Fig. 2a

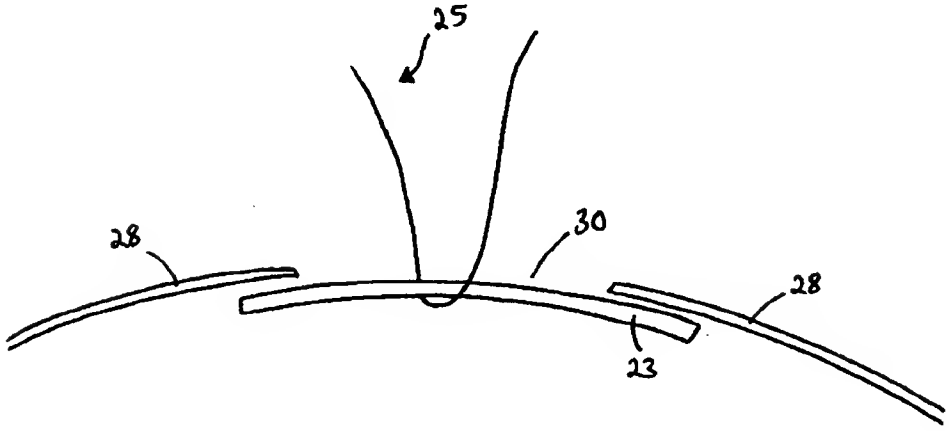

Fig. 2b

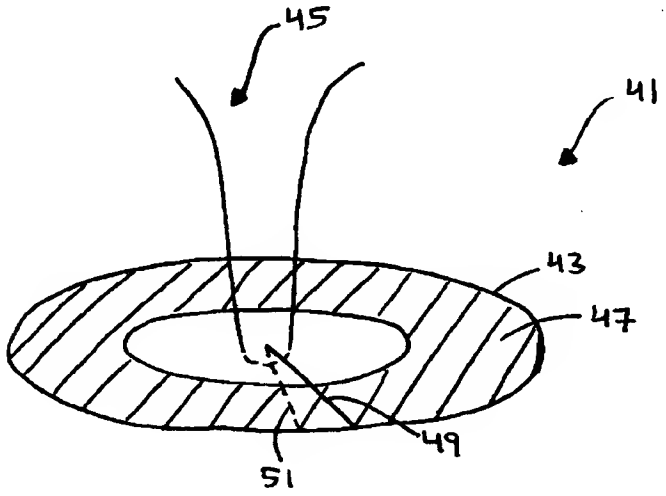

Fig. 3

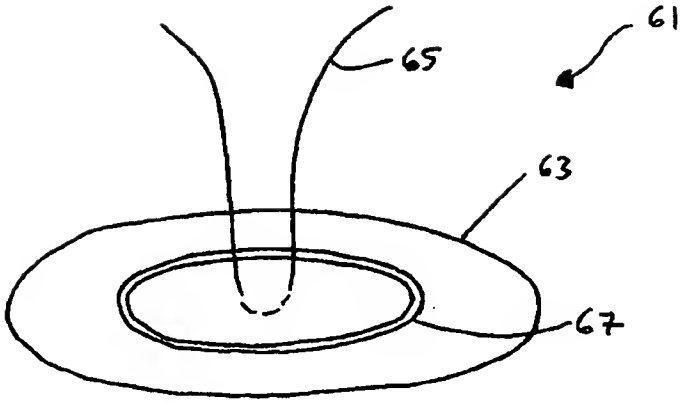

Fig. 4

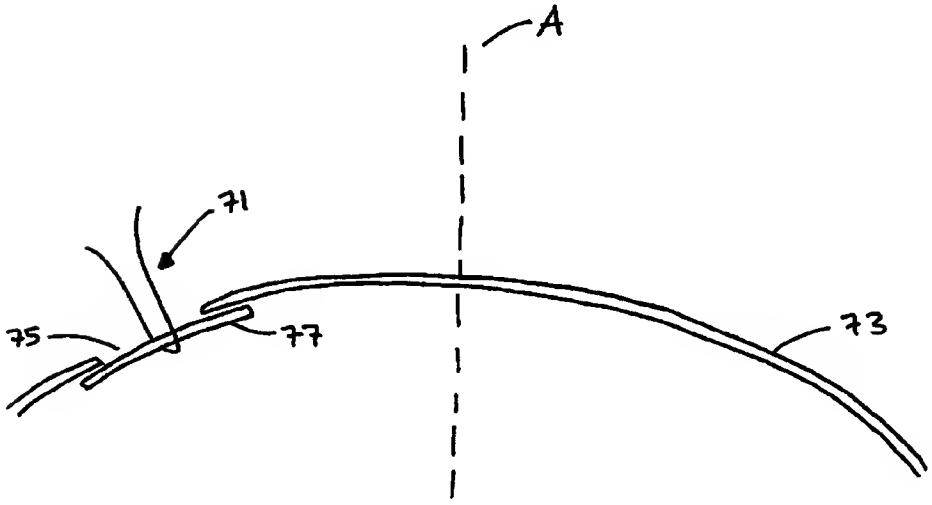

Fig. 5